

claim

1. An X-ray computer tomography apparatus having an X-ray radiation means comprising an X-ray generator and a two-dimensional X-ray image sensor, wherein X-ray beam is radiated on an object to be examined, while said X-ray generator and said X-ray image sensor moves for X-ray circulating radiation relative to each other with an object to be examined interposed therebetween so as to hold their mutual facing positional relation, and wherein a first X-ray tomography is executed for obtaining a curved plane tomography image or a flat plane tomography image, whereas a second X-ray tomography is executed for obtaining a computed tomography image of an interested area of said object, said X-ray computer tomography apparatus comprising:

an object holding means; and

an object moving means;

wherein said first X-ray tomography is executed in a manner that said object holding means is moved by said object moving means depending on a rotary angle of X-ray circulating radiation while holding said object by said object holding means during said X-ray circulating radiation, with the center of the orbit of said X-ray circulating radiation fixed.

2. An X-ray computer tomography apparatus having an X-ray radiation means comprising, an X-ray generator, a two-dimensional X-ray image sensor and a circulating means for circulating said X-ray generator and said two-dimensional X-ray image sensor,

wherein a first X-ray tomography is executed for obtaining a curved plane tomography image or a flat plane tomography image in a manner that said X-ray generator and said two-dimensional X-ray image sensor are moved relative to each other with an object to be examined interposed therebetween so as to hold their mutual facing positional relation, whereas a second X-ray tomography is executed for obtaining a computed tomography image of an interested area of said object, said X-ray computer tomography apparatus comprising;

an object holding means for holding said object; and

an object moving means for moving said object holding means

fixed depending on the rotary angle of said X-ray circulating radiation during said X-ray circulating radiation, with the center of the orbit of said X-ray circulating radiation fixed, when executing said first X-ray tomography of said object.

3. An X-ray computer tomography apparatus having an X-ray radiation means comprising an X-ray generator, a two-dimensional X-ray image sensor and a circulating means for circulating said X-ray generator and said two-dimensional X-ray image sensor,

wherein a first X-ray tomography is executed for obtaining a curved plane tomography or a flat plane tomography image in a manner that said X-ray generator and said two-dimensional X-ray image sensor are moved relative to each other with an object to be examined interposed therebetween so as to hold their mutual facing positional relation, whereas a second X-ray tomography is executed for reconstructing the image of an interested area of the object, said X-ray computer tomography apparatus comprising;

an object holding means for holding said object;

an image processing means for producing the X-ray sectional image by executing Time Delay Integration (TDI) process to the X-ray transmitted image detected by said two-dimensional X-ray image sensor in said first X-ray tomography, which is transmitted through said object by radiating X-ray from said X-ray generator; and

an object moving means for moving said X-ray radiation means or said object holding means.

4. The X-ray computer tomography apparatus as set forth in any one of claims 1 - 3,

wherein said first X-ray tomography is executed for obtaining an X-ray sectional image including a blurred image of the regions other than the target sectional area thorough a curved plane tomography or a flat plane tomography in a manner that said X-ray generator and said two-dimensional X-ray image sensor are moved relative to each other with an object to be examined interposed therebetween so as to hold their mutual facing positional relation, and

wherein said second X-ray tomography is executed for

obtaining an X-ray sectional image excluded a blurred image through a computed tomography which computes and processes a three-dimensional X-ray absorption coefficient data.

5. The X-ray computer tomography apparatus as set forth in any one of claims 2 - 4, wherein relative movement between said X-ray generator and said two-dimensional X-ray image sensor is a rotary movement or a parallel movement.

6. The X-ray computer tomography apparatus as set forth in any one of claims 1 - 5, wherein said second X-ray tomography is executed for obtaining an X-ray computed tomography image around a local region of said object in a manner that the interested area of said object conforms to the rotary center of X-ray circulating radiation by moving said object holding means or said X-ray radiation means after said first X-ray tomography is finished.

7. The X-ray computer tomography apparatus as set forth in any one of claims 1 - 6 comprising:

a display means on which said first X-ray sectional image of said object taken by said first X-ray tomography is displayed, and an interested area selection means for selecting the interested area to be taken by said second X-ray tomography on said first X-ray sectional image displayed on said display means; and

a calculation means of rotary center position for calculating movement data for relatively moving said object holding means or said X-ray radiation means in a manner that said X-ray rotary center conforms to said interested area selected by said interested area selection means;

wherein said object holding means or said X-ray radiation means is moved depending on said movement data, and thereafter said X-ray radiation means is circulated with the center of the orbit of the X-ray circulating radiation fixedly conformed to said interested area during X-ray circulating radiation, thereby executing said second X-ray tomography.

8. The X-ray computer tomography apparatus as set forth in any one of claims 1 - 7, wherein said object holding means has a

chair for holding a patient in sitting position and a head fixing means at the upper part of the chair, and said object holding means further has a pulse motor for moving said object in an axial direction of an X-ray rotary axis or in a vertical direction to the X-ray rotary axis.

9. The X-ray computer tomography apparatus as set forth in claim 8, wherein said X-ray radiation means has a rotary arm rotatable around the rotary center, said rotary arm holds said X-ray generator and said two-dimensional X-ray imaging sensor so as to keep their mutual facing positional relation, and

wherein said first X-ray tomography is executed for obtaining a curved plane sectional image in a manner that said rotary arm turns around the object with the center of the orbit of the X-ray circulating radiation fixed during its tomography, while said chair is moved along a predetermined imaging orbit in synchronism with the turning of said rotary arm.

10. The X-ray computer tomography apparatus as set forth in any one of claims 1 - 8, wherein said first X-ray tomography is executed for obtaining a flat plane sectional image by mutually moving said X-ray generator and said two-dimensional X-ray image sensor held by a rotary arm in a direction opposite to each other, while turning said rotary arm around said object with said interested area interposed therebetween.

11. The X-ray computer tomography apparatus as set forth in any one of claims 1 - 9, wherein said second X-ray tomography is executed for obtaining X-ray computer tomography image of the local region of said object by radiating conical X-ray beam from said X-ray generator.

12. The X-ray computer tomography apparatus as set forth in claim 7, wherein a position guide index or an area guide index for selecting the interested area is shown on the first X-ray sectional image displayed on said display means and the interested area is selected by selecting operation of the position guide index or movement operation of said area guide index.

13. The X-ray computer tomography apparatus as set forth in claim 7 or 12, wherein said interested area selection means is constructed so as to be able to display a diagram of the imaging region corresponding to the first X-ray sectional image and said interested area index movable on the diagram displayed on said display means, and wherein said interested area to be selected for said X-ray CT is constructed so as to be able to be specified by moving operation or selecting operation of said interested area index on the diagram shown.

14. The X-ray computer tomography apparatus as set forth in any one of claims 1 - 13, wherein said two-dimensional X-ray imaging sensor is comprised of any one of CdTe, MOS, CCD, XII, XICCD, photo diode array, or the like.

15. The X-ray computer tomography apparatus as set forth in any one of claims 1 - 14, wherein the start and the termination angles of the X-ray circulating radiation are set in such appropriate position or angle as for a patient to easily come in and out of said object holding means corresponding to said first and said second X-ray tomography, respectively.

16. The X-ray computer tomography apparatus as set forth in any one of claims 1 - 15, wherein an X-ray beam switching means is provided for switching the shape of X-ray beam radiated from said X-ray generator in the first X-ray tomography and the shape of X-ray beam radiated from said X-ray generator in the second X-ray tomography.

17. The X-ray computer tomography apparatus as set forth in any one of claims 1 - 9 or 11 - 16, wherein said curved plane X-ray tomography is executed for obtaining dental panoramic image or curved sectional X-ray image for use in otolaryngology.

18. The X-ray computer tomography apparatus as set forth in any one of claims 1 - 17, said X-ray computed tomography apparatus comprising:

a sectional image link means for subdividing in advance a second X-ray sectional image obtained by said second X-ray tomography into an assembly of X-ray sectional image comprised

of plural X-ray sectional images cut out at a fixed interval at least in one direction of the three dimensional directions and for linking each X-ray sectional image in said assembly of the X-ray sectional images as the second X-ray sectional image to the first X-ray sectional image obtained by said first X-ray tomography corresponding to the imaging region;

an image recording means for storing together with each positional information said first X-ray sectional image and said second X-ray sectional image, each linked to the corresponding information; and

a corresponding image calling means for invoking the linked corresponding X-ray sectional image when at least one of said first X-ray sectional image and said second X-ray sectional image stored in said image recording means is read out and is shown on said display means.

19. The X-ray computer tomography apparatus as set forth in claim 18, wherein said second X-ray sectional image subdivided into the assembly of plural X-ray sectional images is capable of being sequentially reproduced and displayed at least in one direction of three dimensional directions by moving operation of a cursor on said display means, and wherein the linked corresponding X-ray sectional image is invoked from said corresponding image calling means when at least one of said first X-ray sectional image and said second X-ray sectional image stored in said image recording means is read out and shown on said display means.

20. The X-ray computer tomography apparatus as set forth in claim 18 or 19, wherein said first X-ray sectional image is a dental panoramic X-ray image.

21. The X-ray computer tomography apparatus as set forth in any one of claims 18 - 20, wherein the X-ray sectional image corresponding to said first X-ray sectional image and/or the second X-ray sectional image are/is read out to be displayed on a part of said display means, when at least one of the first X-ray sectional image and the second X-ray sectional image stored in said image recording means is read out and displayed on said display means.

22. The X-ray computer tomography apparatus as set forth in any one of claims 1 - 21, wherein said object holding means is movable in an axial direction of said X-ray rotary axis as well as in a vertical direction to said X-ray rotary axis.